

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: HIROI et al

Serial No.: 10/062,666

Filed: February 5, 2002

For: Pattern Inspection Method And System Therefor

Art Unit: 2881

Examiner: J. Berman

Conf. No.: 4688

REPLY BRIEF

Mail Stop: Appeal - Patent (No Fee)
Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 25, 2010

Sir:

This Reply Brief is submitted in response to the Examiner's Answer dated January 25, 2010.

In the middle of page 3 of the Examiner's Answer, the Examiner contends that Mizuno discloses "storing said outputted actual image of the extracted defect candidate and data comprising the location of the defect candidate (lines 39 - 41 in column 6)" (emphasis added) and appellants submit that such is a mischaracterization of the disclosure of Mizuno, noting that of the claims on appeal, independent claim 5 recites the feature of "storing said outputted actual images of the extracted defect candidates of said substrate surface and data including the location of the defect candidates" (emphasis added); independent claim 6 recites the feature of "storing said outputted actual images of the defect candidates of the pattern and data including location information of the defect candidates of the pattern

in a memory” (emphasis added); and independent claim 16 recites the feature of “storing said outputted actual images of said detected defect candidates of said pattern and data including location information of the defect candidates in a memory” (emphasis added). That is, in accordance with the present invention and as recited in the claims on appeal, actual images of the defect candidates are stored and as described in the specification of this application, a defect candidate is determined by comparison of an image of a pattern under inspection with a reference image, and when there is a difference resulting from the comparison, the difference is representative of a defect candidate and an actual image of the pattern at such difference location is stored, as an actual image of the defect candidate. Appellants submit that Mizuno does not disclose or teach storage of an actual image of the extracted or detected defect candidate, irrespective of the Examiner’s contentions with regard thereto.

Fig. 3 of Mizuno is a flowchart of the procedure for inspection wherein in step (10) thereof, a SEM image for inspection is formed, and in step (11) thereof, the SEM image for inspection is compared with a stored reference image to detect differing portions. That is, as described at column 4, lines 66 to column 5, line 7 of Mizuno, the SEM image for inspection is compared with a reference SEM image, and the portion at which both the images differ from each other is detected in step (11), with the differing portion being regarded as a pattern defect, and the pattern defects are classified at least into types of defects of a short circuit, line breakage, protrusion, cavity pin hole and isolation in step (12). As described in column 6, lines 33 - 52 of Mizuno, the means used for classified in the types and sizes of the defects is, for example, of a hardware configuration such as shown in portion A of Fig. 1. In other words, the elements shown in portion A carry out the above-described steps

(12) and (13) of Fig. 3, detailed in Figs. 4 and 5. As described, an image signal is converted into a digital signal by means of the A/D converter 21, the signal is subjected to image processing by the processor 22 and stored into the image memory 23. Appellants submit that the image which is stored into the image memory 23 is an image of the pattern under inspection and is not an actual image of an extracted or detected defect candidate, as apparently contended by the Examiner. Rather, as described in column 6, lines 41 - 52 of Mizuno:

The image stored in the image memory 23 is read out onto the display through the processor 22 and, at the same time subjected to the defect classification. For achieving the defect classification, such software functions for extracting image information to detect the pattern contour, detecting the portion at which the detected image and the reference image differ from each other, determining the continuity between the differing portion and the contour, and calculating the size of the differing portion are incorporated in the processor 22. Of course, the reference image is stored in the memory within the processor. (emphasis added).

Thus, it is apparent that the image storage in the image memory 23 may be considered to include the SEM image of the pattern to be inspected together with the reference image, which is utilized for comparison purposes.

However, it is apparent that an actual image of the extracted or detected defect candidate is not stored in the memory 23, as apparently contended by the Examiner. That is, the following paragraph at column 6, lines 53 - 58 of Mizuno provides that, “the result of the classification is overwritten on the specified point to be inspected on the wafer map and also stored in an inspection database” (emphasis added). Likewise, column 7, lines 6 - 10 of Mizuno provide that “The results of such calculation, together with the results of inspection, are stored in the inspection database, as shown by step (14), and the data are output therefrom and used according to the need, as shown

by step (15). This will be discussed in greater detail below” (emphasis added).

The detail of outputting of information from the stored database is represented by Figs. 6A and 6B of Mizuno, wherein as described in column 7, lines 18 - 22 of Mizuno, “FIG. 6A shows the specified points to be inspected on the wafer map and FIG. 6B shows the results of the defect classification (shown, for example, in Figs. 4 and 5) overwritten on the specified points to be inspected on the wafer map.” (emphasis added). Thus, appellants submit that Mizuno discloses and teaches that the stored information is representative of the information of the defect points and the classification thereof, as illustrated in Figs. 6B, and appellants submit that there is no disclosure or teaching in Mizuno of “storing said outputted actual image of the extracted defect candidate in data comprising the location of defect candidate (line 39 - 41 in column 6)” (emphasis added), as contended by the Examiner, and which feature is a feature of all claims on appeal, and which is necessary for operation of the present invention. In this regard, reference is made to column 8, lines 62 and 63 of Mizuno which provides that “Simultaneous display of the inspection SEM image and the reference SEM image is also possible.” (emphasis added). Thus, it is apparent that while the SEM image may be stored and displayed, Mizuno provides no disclosure or teaching of “storing said outputted actual images of the extracted defect candidates”. (emphasis added). Rather, Mizuno only discloses storing of the SEM image and representations of the images of extracted defect candidates, as represented by the symbol designations in Fig. 6B, which are not actual images of the extracted defect candidates.

Based upon the Examiner's mischaracterization that Mizuno discloses storing the outputted actual image of the extracted defect candidate, the Examiner while recognizing that "Mizuno does not teach to display a selected one of the stored actual images of the extracted defect candidates which is designated on the screen among the extracted defect candidate data displayed in said map format on said screen so that the selected one of the stored actual images is displayed together with said map format on said screen" (emphasis added), the Examiner cites Worster et al for teaching display of a defect image and a wafer map. However, Worster et al, like Mizuno, does not disclose or teach "storing said outputted actual images of the extracted defect candidates", (emphasis added), and then displaying the stored actual image and the wafer map in the manner recited in the claims of this application. That is, in accordance with Worster et al, a laser imaging system 100 is utilized for imaging the wafer and a defect map is displayed, which defect map is produced by a wafer scanner that is not part of the laser imaging system 100. As described in column 14, lines 36 - 39 of Worster et al, the operator can select a defect to revisit by, for instance, using a mouse to point and click on the defect, and appellants submit that when a defect is selected to be revisited, the selected portion of the wafer is newly scanned by the laser imaging system 100 so as to directly display the live laser image produced by the scanning laser beam. Thus, appellants submit that there is no disclosure or teaching in Worster et al of "storing said outputted actual images of the extracted defect candidates of said substrate surface and data including the location of the defect candidates" (emphasis added) as for example, recited in claim 5, and the

other independent claims of this application, nor the feature of “displaying on said screen a selected one of the stored actual images of the extracted defect candidates of said substrate surface which is designated on said screen among the extracted defect candidates data displayed in said map format on said screen so that the selected one of the stored actual images of the extracted defect candidates of said substrate surface is displayed together with said map format and said screen without revisiting said substrate surface the designated defect candidate of said substrate surface to produce an actual image of the designated defect candidate of said substrate surface” (emphasis added), as recited in independent claim 5 and similarly recited in independent claims 6 and 16, noting that the language of “without revisiting” specifically preclude the “revisiting of a defect”, as disclosed and taught by Worster et al.

For the foregoing reasons, appellants submit that the Examiner has mischaracterized the disclosure of Mizuno and Worster et al in relation to the recited features of independent claims 5, 6 and 16, and the proposed combination of references fail to provide the recited features of claims 5, 6 and 16 and the dependent claims. Accordingly, appellants submit that the rejection of all claims on appeal should be reversed.

Appellants note that a Request for Oral Hearing accompanies this Reply Brief.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli,

Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 501.41125X00),
and please credit any excess fees to such deposit account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

/Melvin Kraus/
Melvin Kraus
Registration No. 22,466

MK/jla
(703) 312-6600